FORMATIVE ASSESSMENT – Planning and Conducting a Scientific Investigation

Physical Evidence: Lipstick Chromatography

How can evidence be gathered and tested?

What conclusions can be made from evidence?

How can data be displayed?

Why are accuracy and precision important when conducting forensic labs?

**Crime Story**

Mr. Sternman was a very unpopular man who had managed to make enemies of

everyone he knew. Even his own family found him to be an unbearable bully who lied, cheated, and stole from his wife and grown daughter. Mr. Sternman had scheduled a meeting with his new attorney, Ms. Justice, on the afternoon that he was found dead in his apartment.

After being exiled from his home a year ago, Mr. Sternman had moved into a

beautiful apartment downtown. Because he was so mean, no one ever visited him. He hated house cleaning and his apartment became a shamble. On the day that his body was found, one scene in the apartment was notable because it was so unusual. The dining room table was laid out with a fresh tablecloth and silver candelabra. Two cups of coffee, two napkins, and a plate of cookies were on the table. One of the napkins contained a smear of lipstick.

In this lab, you will analyze the lipstick on the napkin and compare it with the

lipstick of the only three women who were known to have visited Mr. Sternman’s

apartment: his wife, Mrs. Sternman; his daughter, Miss Sternman; and his attorney, Ms. Justice.

**Part One: Chemical Analysis Background**

**You will use a technique known as paper chromatography to distinguish among the brands of lipstick used by each of the suspects and compare them to the lipstick found at the scene of the crime. In paper chromatography, a small amount of the substance to be analyzed is placed on a strip of paper. The paper is placed in a liquid solvent, which is absorbed into the paper. As the solvent moves up the paper, it carries with it the chemicals from the substance that readily dissolve in it. These chemicals travel at different speeds up the paper, and as they travel they separate. The pattern formed by the visible bands of separated chemicals will be different for different mixtures of chemicals – like different brands of lipstick.**

**Materials:**

**Filter paper cut in strips, 3 lipstick samples, one sample from crime scene, solvent liquid chemical, ruler, beakers, pencil, wooden craft sticks, tape**

**Procedure:**

1. **Gather materials.**
2. **Collect 3 suspect lipstick samples and one crime scene sample.**
3. **Mark in pencil where the lipstick sample starts.**
4. **Add 50 ml of the solvent liquid into the beakers.**
5. **Tape 2 filter paper strips to each of the wooden sticks.**
6. **Hang across the beaker allowing the filter paper to touch the solvent.**
7. **Time for at least 10 minutes.**
8. **Remove from beaker solution and place on paper towel.**
9. **Mark where the solvent traveled up to and record.**

**10) Measure the distance in cm each component of the lipsticks moved from the spotted pencil line. Some lipsticks have only two or three components, and some have more.**

1. **Enter these measurements on the Data Table.**
2. **Calculate the Rf factor for each lipstick and the crime scene sample.**

**Rf =**

**Distance traveled by one lipstick component from the spotted pencil line**

**------------------------------------------------------------------------------------------**

**Distance the solvent moved from the spotted pencil line**

**DATA TABLE:**

**Lipstick Samples BY Rf Factors**

Rff = Distance traveled by **one** lipstick component from the origin –Column 3

             Distance the solvent moved from the origin (column 4)

                                                 **Column 3**         **Column 4**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lipstick Samples** | **Color of Components** | **Distance Lipstick Components Moved (cm)** | **Distance**  **Mobile Phase Moved**  **In cm** | **Rf Values for Each Colored Component** |
| **C (crime scene)** | 1. |  |  |  |
|  | 2. |  |  |  |
|  | 3. |  |  |  |
|  | 4. |  |  |  |
| **W (Mrs. Sternman)** | 1. |  |  |  |
|  | 2. |  |  |  |
|  | 3. |  |  |  |
|  | 4. |  |  |  |
| **D (Ms. Sternman)** | 1. |  |  |  |
|  | 2. |  |  |  |
|  | 3. |  |  |  |
|  | 4. |  |  |  |
| **A (Ms. Justice)** | 1. |  |  |  |
|  | 2. |  |  |  |
|  | 3. |  |  |  |
|  | 4. |  |  |  |

                               